

SERUM γ -GLUTAMYL TRANSPEPTIDASE ACTIVITY IN MYOCARDIAL INFARCTION

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The study of serum γ -glutamyl transpeptidase (γ -GT) activity in hepatobiliary disease has recently aroused much clinical interest (Rutenburg, Goldberg, and Pineda, 1963; Szczeklik, Orłowski, and Szewczuk, 1961; Villa *et al.*, 1965).

This enzyme catalyses the synthesis of poly- γ -glutamyl peptides and their splitting by transpeptidation. The highest enzymatic activity is found in the liver and kidney and only a low level of activity is found in the heart (heart/liver ratio=1:10). In spite of the low concentration of this enzyme in cardiac tissue, a study of serum γ -GT activity in myocardial infarction was suggested by the importance of glutamic acid in heart metabolism (Bernsmeier and Rudolph, 1961; Matsubara, 1962) and by the increase of this amino acid in the serum of patients with myocardial infarction (Efimova, 1963).

SUBJECTS AND METHODS

Serum γ -GT activity was determined by the method of Goldberg *et al.* (1963) using the chromogenic substrate γ -L-glutamyl- β -naphthylamide (Light and Co., England). The values are expressed in units as the number of micromoles of β -naphthylamine liberated per 100 ml. of serum in two hours. Each value is the mean of duplicate determinations.

Serum glutamic-pyruvic and glutamic-oxaloacetic transaminases (SGPT, SGOT) were determined according to Wróblewski and LaDue (1956). Serum leucin-amino peptidase (LAP) was determined according to Goldberg and Rutenburg (1958).

The serum γ -GT activity was assayed in 40 healthy subjects between the ages of 24 and 55 years. No changes were observed during consecutive day determinations. In 18 patients with myocardial infarction, diagnosed on clinical and electrocardiographic grounds, the serum γ -GT activity was measured at various intervals after the onset of symptoms. In 10 of these patients serial estimations at intervals not exceeding 48 hours were made until normal values of enzyme activity had been reached. Consecutive measurements were also made in 6 patients with angina pectoris and no signs of myocardial infarction.

RESULTS

The determination of γ -GT activity in the serum of normal subjects showed a mean value of 19.8 ± 3.95 units. Values between 40 and 160 units were observed in patients with myocardial infarction.

In the first four days the serum levels of γ -GT were however normal. The enzyme activity increased from the fifth day, reached the maximum level at about the tenth day, and did not return to the normal range until after 30 days.

In Fig. 1 this pattern of the changes in the serum γ -GT is compared with the SGOT levels in the same cases. In all these subjects the values of SGPT and LAP were normal. No changes in serum

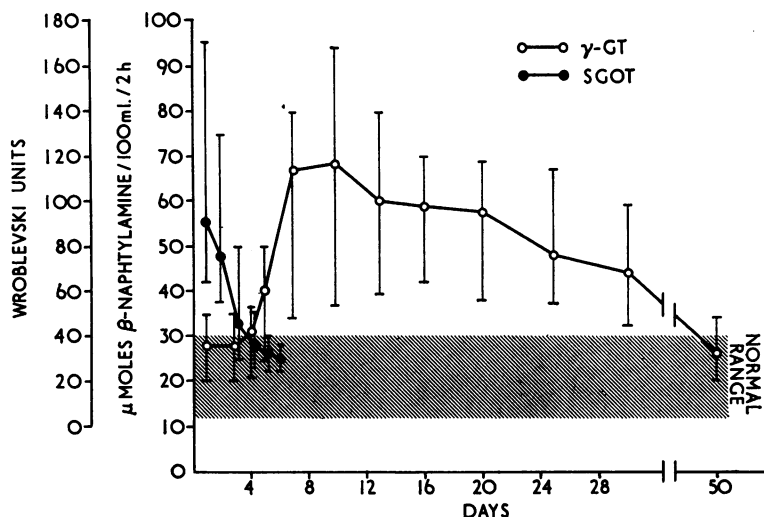


FIG. 1.—Behaviour of serum γ -glutamyl transpeptidase (γ -GT) and serum glutamic-oxaloacetic transaminase (SGOT) followed for a prolonged period of time in 10 patients with myocardial infarction.

γ -GT were observed, even over long periods, in patients with angina and no signs of myocardial necrosis.

DISCUSSION

These findings suggest that some metabolic disturbances in myocardial infarction appear after the acute phase and last for a month. The mechanism responsible for the late increase in serum levels of γ -GT seems, however, difficult to explain.

The increased activity in myocardial infarction is comparatively lower than in hepatobiliary disease. However, the serum changes observed in myocardial infarction seem independent of the liver, since no clinical signs of hepatic trouble were present in these patients; moreover, the values of SGPT and LAP were in the normal range.

Since the γ -GT seems to be located in the cellular microsome fraction (Villa *et al.*, 1965), it might be thought that it would appear later and more slowly in the series because the damage to these structures represents the last effect of the anoxic injury to the myocardial cell. If this is the case the process of liberation of enzymes from cardiac cells would be as follows (Table). The first enzyme appearing in the serum after a myocardial infarction is myokinase (Schreiber, 1964),

TABLE

PEAK TIMES OF SERUM ENZYMES IN PATIENTS WITH MYOCARDIAL INFARCTION

Serum enzymes	Time
Myokinase	6 hours
Creatine phosphokinase	12 hours
Glutamic-oxaloacetic transaminase	24 hours
Lactate dehydrogenase	2 days
α -hydroxybutyrate dehydrogenase	2 days
γ -glutamyl transpeptidase	10 days

progressively followed by creatine-kinase (Stich and Tsirimbas, 1962), glutamic-oxaloacetic transaminase, lactic dehydrogenase, α -hydroxybutyrate dehydrogenase (Preston, Batsakis, and Briere, 1964), and finally by γ -glutamyl transpeptidase.

However, other mechanisms could be considered: for example a higher rate of γ -GT synthesis as an expression of the process of repair of the myocardium.

SUMMARY

A study of serum γ -glutamyl transpeptidase activity has been conducted in patients with myocardial infarction.

The results indicate that in the first four days the serum levels of γ -GT are normal. On the fifth day after the onset of symptoms the γ -GT activity increases, reaching the highest values at the tenth day. Normal values of the serum γ -GT were restored only after the 30th day. These findings suggest that some serum enzymatic activities may increase after the acute phase of myocardial infarction and last for a month.

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